METHOD OF TRANSFERRING FACILITY INFORMATION BY RADIO AND CONTROL CENTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method of transferring facility information by radio and a control center and, more particularly, to the use of a base station for a signal transfers service during the process of radio signal transmission.

2. Description of Related Art

Conventionally, when wishing to find the location of a particular nearby facility, for example, the location of a nearby parking lot, one may use a map or connect to the Internet to use an electronic map. Much attention must be paid when searching a map for the location of the facility due to the maps small size, resulting in an extended search time. Further, before searching the map, the user needs to know the current location so as to correspond the current location to the page number of the conventional map used or the relative position in the electronic map used.

According to conventional methods, two steps are involved when searching for the location of a particular nearby facility. . The first step is to find the map corresponding to the current location. The second step is to search the selected map for the location of the desired facility. The two-step process is quite time consuming. And, if the user does not know his (her) location he (she) cannot proceed to the second step.

Therefore, it is desirable to provide a method of transferring

facility information by radio and a control center that enables the user to rapidly search for the location of a particular nearby facility when the user does not know his (her) current location.

SUMMARY OF THE INVENTION

The main object of the present invention is to enable users to find the location of a particular nearby facility using a quick and easy method. For example: a parking lot, gas station, police station, hospital, etc. It is another object of the present invention to provide a control center using a method of transferring facility information by radio, which allows the user to quickly find the location of a particular nearby facility based on the location and the information provided by a nearby base station when the user does not know his (her) current location.

To achieve these and other objects of the present invention, a control center is provided for enabling the user to obtain the desired information through a radio communications device (for example, cellular telephone) via a nearby base station. The control center comprises a communication system adapted to receive messages from the outside and to transmit messages to the outside; and a computer system connected to the communication system. The computer system comprises a facility information database. The control center uses the information of the location of the nearby base station or the information of the location of the radio communications device (in case the radio communication device is equipped with a Global Positioning System) as the target, and then searches a facility information database for the desired facility information subject to the targets location. The facility

information database has stored the names, locations and other important data of multiple facilities. Therefore, if the user does not know his (her) current location, the control center can still search for the location, or other relevant information, of the desired nearby facilities from the database based on the target. For example: the location and significant information of available parking lots within a 5 kilometer radius of a nearby base station (target), and then providing the location of available parking lots to the radio communications device.

Other objects, advantages, and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates the environment in which the invention is used.

FIG. 2 illustrates the structural design of the control center according to the present invention.

FIG. 3 is a functional block diagram of a first embodiment of the radio communications device according to the present invention.

FIG. 4 illustrates an embodiment of the facility information database according to the present invention.

FIG. 5 is an operation flow chart of the first embodiment of the present invention.

FIG. 6 is an operation flow chart of the second embodiment of the present invention.

FIG. 7 is an operation flow chart of the third embodiment of the present invention.

FIG. 8 is an operation flow chart of the fourth embodiment of the present invention.

FIG. 9 is an operation flow chart of the fifth embodiment of the present invention.

FIG. 10 is an operation flow chart of the sixth embodiment of the present invention.

FIG. 11 is a functional block diagram of a second embodiment of the radio communication device according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates the environment in which the invention is used. As illustrated, the present invention provides a control center **10**, which enables users to obtain information through a radio communication device **30** (for example, a cellular telephone). In order to ensure reliable quality communication in a big area with radio communication architecture, multiple base stations **81~83** are available. When transmitting or receiving a message through the radio communication device **30**, the base station nearest to the radio communication device **30** controls and services the transferring of the message. For example, the nearest base station **81** provides the service of transferring the message. Finally, base station **81** transfers the message to the control center **10** through a PSTN (Public Switching Telephone Network) **80**.

When wishing to get particular information with the radio communication device **30**. Such as the locations of nearby parking lots, the invention provides two searching methods. For example, there are eight parking lots **P1~P8** shown in FIG. 1, with the information being

stored in the control center **10**. The first search method uses base station **81,** which is nearest to the radio communication device **30** to provide information of parking lots around base station **81**. For example, the location information of the parking lots **P1, P2,** and **P3** in the surrounding area **71** within 5 kilometers of base station **81**. The second search method uses radio communication device **30** to provide the information of parking lots around the radio communication device **30,** for example, the information of the parking lots **P3** and **P4** in the surrounding area **72** within 3 kilometers from the radio communication device **30**. When the second searching method is adopted, the radio communication device **30** must be able to provide its location information.

Referring to FIG. 2, the control center **10** comprises a communication system **11** adapted to receive messages from or transmit messages to the outside (for example, the PSTN **80**) either by cable or radio, and a computer system **12** connected to the communication system **11** adapted to run the requisite software program. According to the present invention, the computer system **12** comprises a facility information database **20**.

FIG. 4 illustrates an embodiment of the facility information database **20**. According to this embodiment, the facility information database **20** includes columns for facility code number **21**, facility type **22**, facility name **23**, location coordinates **24**, description of location **25,** and relevant facility descriptions **26**. In actual practice, facilities of the same type have the same facility code number **21**, for example, the

facility code number **21** is 1 for parking lots, or 3 for police stations. Facility name **23** lists the names of the respective facility, for example, Great Asia Tuen-Nan Parking Lot, Ta-An Forest Parking Lot, etc. Location coordinates **24** can be a coordinate system set by the user, or the longitude and latitude coordinates of the GPS (Global Positioning System). Location coordinates **24** can also be a location code number that indicates the (precise or general) location of a particular facility. Description of location **25** can be the address of the respective facility, or a particular landmark. Relevant facility description **26** describes the information of the respective facility the user may wish to know. For example, if facility type **22** is a parking lot, relevant facility description **26** could be the total number of parking spaces, the number of vacant parking spaces, the parking fee, etc. If facility type **22** is a gas station, facility related description **26** could provide the working hours of the respective gas station. It is to be understood that the information content of relevant facility description **26**, for example, the information of the number of vacant parking seats may be changed frequently. Therefore, the control center **10** must monitor the parking lot (through the Internet or a fixed cable).

FIG. 3 is a functional block diagram of one embodiment of the radio communication device **30**. The radio communication device **30** can be a cellular telephone (either connectable or not connectable to the Internet), a PDA (Personal Data Assistant) with radio communication function, or a Laptop PC (Personal Computer) with radio communication function. As illustrated in FIG. 3, the radio communication device **30**

comprises a CPU **31**, a memory unit **32**, a display **33**, an input device **34**, and a radio transmitter/receiver device **35**. The memory unit **32** has stored therein particular data and software programs for the CPU **31** to run. The display **33** can be a device that displays graphics and letters. Alternatively, the display **33** can be a touch panel with input function. The input device **34** can be a keyboard, mouse, or a touch control device for a touch panel. The radio transmitter/receiver device **35** is an apparatus for transmitting and receiving radio signals. In an alternate form the radio communication device **30** of the present invention further comprises a GPS (Global Positioning System) **38** that provides the longitude and latitude coordinates of the radio communication device **30** (based on the principle of using an antenna to receive signals from three global positioning satellites and computing the current global positioning data, for example, longitude and latitude coordinates).

The operation of the present invention is outlined hereinafter with reference to FIGS. 5 through 9. FIG. 5 is a flow chart showing the operation of a first embodiment of the present invention. According to this embodiment, the operation of the present invention includes the following steps:

Step A1:

where the radio communication device **30** requests a connection to the control center **10**; for example, the user dials a telephone number, which is the control center **10**, or connects to a web site, which is the control center **10**;

Step B1:

where the base station **81** transfers the message to the control center **10**;

Step C1:

where the control center **10** receives the radio communication device **30** request , and the radio communication device **30** is connected to the control center **10**;

Step A2:

where the user selects the service item by inputting the facility code number **21**, for example, inputting 1 to search for parking lot information; the control center **10** may provide a voice service to guide the user as to what code number, character or sign to input for the desired service;

Step C2:

where the control center **10** receives the service item request;

Step C3:

where the control center **10** requests the base station **81** in charge to transfer the information of its location (location coordinates) or code number so as to know which base station is in charge of the communication with the radio communication device **30**; the control center **10** immediately knows the location of the base station in charge subject to the code number if it has the information of base station code numbers and location index stored therein;

Step B2:

wherein the request of the control center **10** of demanding the base station **81** to transfer the information of its location or code number

is received;

Step B3:

where the information of the location or code number of the base station **81** is transmitted;

Step C4:

where the message of the location or code number of the base station **81** is received;

Step C5:

where the facility information database **20** is searched for the required facility information subject to the requested service item and the information of the location or code number of the base station **81**; for example, the service item requested by the use is the information of parking lots and the default value is to search for facilities in the area within 5 kilometers from the base station **81**; the user may be requested to input the desired distance, for example, "4 kilometers", and the information of parking lots is the parking lots in the area within 4 kilometers from the base station **81**;

Step C6:

where the control center **10** transfers found facility information to the radio communication device **30**; and

Step A3:

where the radio communication device **30** receives the found facility information from the control center **10**, and displays the found facility information or the information related to the found facility information.

FIG. 6 is a flow chart showing the operation of a second embodiment of the present invention. According to this embodiment, the operation of the present invention includes the steps A1, B1, C1, B3, C4, A2, C2, C5, C6, and A3. With respect to the description of the related steps, please refer to the aforesaid description for FIG. 5.

FIG. 7 is a flow chart showing the operation of a third embodiment of the present invention. According to this embodiment, steps B3 and C4 are respectively exchanged with steps A2 and C2 in comparison with the aforesaid second embodiment, i.e., step A2 and step C2 regarding service item selection are processed first, and step B3 and step C4 regarding the location or code number of base station **81** is processed later. Further, when requesting a connection to the control center **10** during step A1, the user also selects the service item. For example, when dialing a telephone number, the user also dials the facility code number **21**, i.e., the format is "Telephone number-Facility code number **21**". This third embodiment can be set to proceed steps A2 and steps C2 after connection of the radio communication device **30** to the control center **10**.

The order of the steps of the operation flow of the third embodiment is: A1, A2, B1, C1, C2, B3, C4, C5, C6, and then A3. With respect to the description of the related steps, please refer to the description for FIG. 5.

FIG. 8 is a flow chart showing the operation of a fourth embodiment of the present invention. In comparison with the aforesaid third embodiment, the fourth embodiment enables the base station **81** to

run steps B1 and B3 at the same time, so that the control center **10** runs step C4 when running C1 and C2, i.e., base station **81** sends its location or code number information to the control center **10** when the radio communication device **30** requests a connection to the control center **10**.

The order of the steps of the operation flow of the fourth embodiment is: Step A1, Step A2, Step B1, Step B3, Step C1, Step C2, Step C4, Step C5, Step C6, and then Step A3. With respect to the description of the related steps, please refer to the description for FIG. 5.

FIG. 9 is a flow chart showing the operation of a fifth embodiment of the present invention. In comparison with the aforesaid first embodiment, the radio communication device **30** of the fifth embodiment is equipped with a GPS **38**, therefore the radio communication device **30** can provide the information of its location to the control center **10**. According to this fifth embodiment, the operation of the present invention includes the steps of:

Step A1, Step B1, Step C1 (with respective to the aforesaid steps, please refer to the description for FIG. 5.);

Step A2:

where the user selects the service item and simultaneously proceed Step A2-1;

Step A2-b3:

where the information of the location of the radio communication device **30** is transmitted to the control center **10**;

Step C2:

where the control center **10** receives the service item request,

and then proceeds Step C2-1;

Step C4-1:

where the information of the location of the radio communication device **30** is received;

Step C5-1:

This step is similar to the aforesaid Step C5 but the target is the location of the radio communication device **30** but not the location of the base station **81** indicated in the aforesaid embodiments from the first through the fifth.

Step C6, and Step A3:

With respect to the description of the related steps, please refer to the description for FIG. 5. Further from the first through the fifth embodiments, Step A2-b3 may substitute for Step B3; step C4-1 may substitute for Step C4; Step C5-1 may substitute for Step C5, enabling the target to be the information of the location of the radio communication device **30**.

FIG. 10 is a flow chart showing the operation of a sixth embodiment of the present invention. According to this embodiment, the control center **10** proceeds a different process. If the radio communication device **30** provides the its location information, the target in the sixth embodiment should be the location information of the radio communications device **30**. However, if the radio communications device **30** does not provide its location information, the target should be the information of the location of the base station **81**.

The operative steps of the sixth embodiment is outlined

hereinafter. When started, it enters Step C11 to receive the information from the radio communication device **30**. Step C11 includes the sub-step of C2 of receiving the service item request, and the sub-step of C4-1 of receiving the location information of the radio communication device **30**. The control center **10** may receive or may not receive the location information of the radio communication device **30** subject to the architecture of the radio communication device **30**, and therefore the sub-step of C4-1 may be eliminated. After Step C11, it enters Step C12 to judge if the information of the location of the radio communication device **30** has been received. i.e., Does Step C11 include Step C4-1? Or the received location information of the radio communication device **30** is an error even if Step C4-1 is included in Step C11. And then, it enters step C13 if the information of the location of the radio communication device **30** has been received, or step C14 if not. Once step C13 is entered, it sets the target to be the location of the radio communication device **30**, and then enters Step C16. Once step C14 is entered, same as the aforesaid Step C3, it requests the base station **81** to transfer its location or code number information, and then it enters step C15 to set the target to be the location of the base station **81**, and then it proceeds to Step C16. Once step C16 is entered, it proceeds the aforesaid Step C5 or Step C5-1 to use facility location information database **20** to search the desired facility information subject to the requested service item and requested information of the location of the destination, and then enters Step C17, same as the aforesaid Step C6, to transfer found facility information to the radio communication device **30**.

The sixth embodiment is to set the target to be the location of the radio communication device **30**, so that the control center **10** sets the target to be the location of the radio communication device **30** when information of the location of the radio communication device and the information of the location of the base station **81** is received.

FIG. 11 is a system block diagram of an alternate form of the radio communication device. According to this embodiment, the radio communication device **30a** is installed in a motor vehicle. In this case, the radio communication device **30a** can be an electronic apparatus of the motor vehicle, comprising a CPU **31**, a memory unit **32**, a display **33**, an input device **34**, a cellular telephone **36**, an audio broadcasting device **37**, and a GPS **38**. The radio communication device **30a** is connected to the control center **10** through the cellular telephone **36**. Because the radio communication device **30a** is equipped with a GPS **38**, the memory unit **32** is preferably provided with an electronic map (that can be a card based memory or built-in memory, or downloaded from the Internet through the cellular telephone **36**). When the desired facility message is obtained from the control center **10**, the facility can be marked on the electronic map. Further, the cellular telephone **36** can be constructed to function as a radio communication device **30** for use with another equipment of the motor vehicle.

Although the present invention has been explained in relation to its preferred embodiments, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed. For example, the

control center **10** can be constructed to connect to the Internet by radio without through the aforesaid PSTN **80**. In case the control center **10** provides one particular service only (for example, parking lot information), the aforesaid Step A2 and Step C2 are eliminated, and the columns for facility code number **21** and facility type **22** are eliminated from the facility information database **20**. The control center **10** can also be set to provide a respective telephone number for a respective service offered, for example, calling the telephone number XXX1 is to request parking lot information, or calling the telephone number XXX3 is to request police station information. In this case, the aforesaid Step A2 and Step C2 are eliminated.